



PHYSICO-CHEMICAL AND BIO-CHEMICAL CHARACTERISTICS OF GROUND WATER QUALITY IN SATNA DISTRICT (M.P.)

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ABSTRACT All life on the earth depends on water. Fresh water is critical, infinite, vulnerable, renewable natural resources on the earth and plays as important role in our living environment without it life is impossible. Water is a very important component of the environment and it sustains life on the earth. Human beings depend on water for their survival. Water is also a raw material for photosynthesis and therefore, is important for crop production. Obviously, an optimum agricultural production depends on water and soil quality. All the results confirm that the ground and surface water quality of Satna was not up to the mark and is slowly degrading even through present condition is not very bad but if same continues in future the ground water source will be completely polluted and become unfit for drinking and other purposes.

KEYWORDS : Physico-chemical, Ground water quality, Pollution, Drinking water.

INTRODUCTION

All life on the earth depends on water. Fresh water is critical, infinite, vulnerable, renewable natural resources on the earth and plays as important role in our living environment without it life is impossible. Water is a very important component of the environment and it sustains life on the earth. Human beings depend on water for their survival. Water is also a raw material for photosynthesis and therefore, is important for crop production. Obviously, an optimum agricultural production depends on water and soil quality.

Water constitutes about 70% of the body weight of almost all living organism. Life is not possible on this planet without water. It exists in three states namely solid, liquid and gas. It acts as a media for both chemical and biochemical reactions and also as internal and external medium for several organisms. About 97.2% of water on earth is salty and only 2.8% is present as fresh water from which about 20% constitutes ground water. Ground water is highly valued because of certain properties not possessed by surface water. Water quality characteristics of aquatic environments arise from a massive amount of physical, chemical and biological interactions. The water bodies: rivers, lakes and estuaries are continuously subjected to a dynamic state of change with respect to their geological age and geo chemical characteristics. Aquatic systems worldwide are reported to be much polluted due to untreated sewage disposal and industrial effluents being disposed directly into the rivers. Wastes usually contain a wide variety of organic and inorganic pollutants including solvents, oils, grease, plastics, plasticizers, phenols, heavy metals, pesticides and suspended solids. The quality of ground water depends on various chemical constituents and their concentration, which are mostly derived from the geological data of the particular region. Industrial waste and the municipal solid waste have emerged as one of the leading cause of pollution of surface and ground water. In many parts of the country available water is rendered non-potable because of the presence of heavy metal in excess.

As water percolates through the landfill, contaminants are leached from the solid waste. Leach ate is produced when moisture enters to refuse in a landfill, extracts contaminants into the liquid phase, and produces moisture content sufficiently high to initiate liquid flow. Leach ate is generated in a landfill as a consequence of the contact of water with solid waste. During last decade, this is observed that ground water get polluted drastically because of increased human activities consequently number of cases of water born diseases has been seen which is a cause of health hazards. It is believed that groundwater must possess purity and it should be free from chemical contamination and micro organisms. But the rapid increase in population and industrialization together with the lack of wisdom to live in harmony with nature has led to the deterioration of good quality of water resulting in water pollution.

Water is not fit for domestic usage without proper treatment. So for the present study I have taken to physico-chemical and bio-chemical characteristics of ground and surface water quality in Satna district (M.P.). The district is generally covered with red & yellow mixed soils.

The soil has .developed mainly from the weathering of shale's & sandstones. Generally soil is argillaceous mixed with lime kanker.

Satna is a town and district in the state of Madhya pradesh India. It is a town of religious culture, historical and archaeological importance. Situated in the Baghelkhand region. Satna is geography located at coordinated 24.16o N latitude & 80.83o longitude. 7,502 Km. Total area and population 22,28,619 census (2011) of satna district. The normal annual rainfall of Satna district is 1092.1 mm. The district receives maximum rainfall during south-west monsoon period (i.e. June to September) and about 87.7% of annual rainfall is received during this period. Only 12.3% of the annual rainfall takes place between periods October to May (Central Ground Water Board- 2013). In the present study various physico-chemical parameters were detected like pH, Temperature, TDS, TH, TS, TSS, Ca, Mg, Cl, DO, COD, BOD, EC and Alkalinity.

MATERIAL AND METHODS

The sampling stations were chosen at different site of the study area, water samples were collected from rural area, and town area of Satna (M.P.) For testing the water sample were collected in different sterile plastic bottles from each station. Sampling was conducted during the month of July to September 2018. After collection of the sample the bottles were tightly capped and were immediately transported to the laboratory to avoid any unpredictable changes in the physico-chemical characteristics. All the sampling locations are presented below in table 1.

Table-1. List of sampling locations

| s.no | Sampling location | Water Source |
|------|--------------------------------|--------------|
| 1 1. | Satna (RW1) | Hand pump |
| 2 2 | Maihar (RW2) | Hand pump |
| 3 3 | A Uchehra (RW-3) | Hand pump |
| 4 4 | Kothi (RW-4) | Hand pump |
| 5 5 | Majhagawan (RW-5) | Hand pump |
| 6 6 | Pindra (RW-6) | Hand pump |
| 7 7 | Village Rajaula (RW-7) | Hand pump |
| 8 8 | Water supply chitrakoot (RW-8) | Borewells |

RESULT AND DISCUSSION

The ground water and surface water samples were analyzed for temperature, pH, TDS, TH, DO, BOD, COD, TS, TSS, Ca, Mg, Cl, Alkalinity, EC. All the result are presented in Table-2, and drinking water standard values are presented in Table-3. The physico-chemical characteristic of ground water at different points of Satna Region are below.

Table-2: Physico-chemical characteristics of ground water

| Parameter / S.N. | RW1 | RW2 | RW3 | RW4 | RW5 | RW6 | RW7 | RW8 |
|------------------|-----|-----|-----|-----|-----|-----|-----|-----|
| | | | | | | | | |

| | | | | | | | | |
|------------|-------|------|------|------|------|------|------|------|
| Temp. | 28 | 24 | 29 | 22 | 24 | 25 | 29 | 23 |
| pH | 6.7 | 7.18 | 7.2 | 7.5 | 7.3 | 6.8 | 6.4 | 6.9 |
| TH. | 547 | 530 | 470 | 582 | 410 | 464 | 414 | 513 |
| TDS | 822 | 543 | 587 | 662 | 736 | 509 | 550 | 577 |
| TS | 400 | 588 | 602 | 688 | 792 | 580 | 644 | 668 |
| TSS | 242 | 260 | 210 | 365 | 184 | 275 | 182 | 200 |
| Ca | 108.3 | 123 | 95.8 | 89.2 | 88.6 | 69.3 | 127 | 47.3 |
| Mg | 67.3 | 54.3 | 56.2 | 87.6 | 57.8 | 36.8 | 62.4 | 72.1 |
| Cl | 4.6 | 5.7 | 9.3 | 5.69 | 7.3 | 2.9 | 3.7 | 4.5 |
| DO | 2.6 | 5.6 | 2.8 | 4.12 | 4.8 | 6.3 | 4.4 | 6.0 |
| COD | 6.0 | 9.0 | 6.5 | 6.7 | 7.0 | 7.1 | 6.8 | 8.2 |
| BOD | 1.2 | 0.9 | 1.8 | 1.19 | 1.4 | 1.4 | 1.0 | 1.5 |
| EC | 1283 | 847 | 916 | 1033 | 999 | 1149 | 794 | 901 |
| Alkalinity | 188 | 189 | 200 | 194 | 196 | 199 | 188 | 175 |

Note- All the parameter are expressed in mg/l except pH, temperature and electrical conductivity.

Table-3: WHO guideline for drinking water quality, 1984

| Parameter | Standard value |
|----------------|----------------|
| Temperature | 2 50C to350c |
| PH | 8.5 mg/l |
| TDS | 500mg/l |
| Total hardness | 300-600mg/l |
| DO | 4mg/l |
| BOD | 6 mg/l |
| COD | 10mg/l |
| Nitrate | 45 mg/l |
| Sulphate | 250mg/l |

The present work identifies the ground water quality of Satna District. The results and discussion of ground water quality of Satna District are given below.

Temperature: The temp. recorded ranges between 220c to 290c .Maximum temp. Observed at sampling location RW3 and RW7, that is 290c and minimum temp. observed at sampling location RW4, that is 220c.

pH : The pH recorded ranges between 6.4 to 7.5 .Maximum pH observed at sampling location RW4, that is 7.5 and minimum pH observed at sampling location RW7, that is 6.4.

Total Dissolve Solid: The TDS recorded ranges between 509 to 822. Maximum TDS observed at sampling location RW1, that is 822 and minimum TDS observed at sampling location RW6, that is 509.

Total Hardness: The Total hardness recorded ranges between 410 to 582. Maximum total hardness observed at sampling location RW5, that is 582 and minimum total hardness observed at sampling location RW4, that is 410.

DO: The DO recorded ranges between 2.6 to 6.3. Maximum DO observed at sampling location RW6, that is 6.3 and minimum DO observed at sampling location RW1, that is 2.6.

BOD: The BOD recorded ranges between 0.9 to 1.8. Maximum BOD observed at sampling location RW3, that is 1.8 and minimum BOD observed at sampling location RW2, that is 0.9.

COD : The COD recorded ranges between 6.0 to 9.0. Maximum COD observed at sampling location RW2, that is 9.0 and minimum COD observed at sampling location RW1 that is 6.0.

TS (Total Solid): The total solid recorded ranges between 400 to 792 . Maximum total solid observed at sampling location RW5, that is 792 and minimum total solid observed at sampling location RW1, that is 400.

TSS (Total Suspended Solid): The total suspended solid recorded

ranges between 182 to 365. Maximum TSS observed at sampling location RW4, that is 365 and minimum TSS observed at sampling location RW7, that is 182.

Ca (Calcium): The Ca recorded ranges between 47.3 to 127. Maximum range of Ca observed at sampling location RW7, that is 127 and minimum range of Ca observed at sampling location RW8, that is 47.3.

Mg (Magnesium): The Mg recorded ranges between 36.8 to 87.6. Maximum range of Mg observed at sampling location RW4, that is 87.6 and minimum range of Mg observed at sampling location RW6, that is 36.8.

Electrical Conductivity: The EC recorded ranges between 794 to 1283. Maximum range of EC observed at sampling location RW1, that is 1283 and minimum range of EC observed at sampling location RW7, that is 794.

Cl (Chloride): The Chloride recorded ranges between 2.9 to 9.3. Maximum range of chloride observed at sampling location RW6, that is 9.3 and minimum range of chloride observed at sampling location RW3, that is 2.9.

Alkalinity : The alkalinity recorded ranges between 175 to 200. Maximum range of alkalinity observed at sampling location RW3, that is 200 and minimum range of alkalinity observed at sampling location RW8, that is 175.

CONCLUSION

All the above results confirm that the ground water quality of Satna was not up to the mark and is slowly degrading even through present condition is not very bad but if same continues in future the ground water source will be completely polluted and become unfit for drinking and other purposes .It is high time to preserve and protect this valuable ground water source for this various measures have to be taken to control the contamination from different sources. That include proper treatment and disposal of the effluent, proper drainage for the domestic and agricultural wastes, uses of chemical and hazardous fertilizers, proper and hygienic maintenance of the sanitary conditions of the area and above all the inhabitants should be given proper knowledge to improve their own hygienic habits.

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